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The Relation of Bees to Fruit Growing

W. Newell

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THE
RELATION OF BEES
TO
FRUIT GROWING

BY WILMON NEWELL

An address delivered before the Georgia State Horticultural Society, at Athens, Ga., Aug. 3, 1903.

Reprinted from the Proceedings of 27th Annual Meeting of the Georgia State Horticultural society.

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THE RELATION OF BEES TO FRUIT GROWING.

By Wilmon Newell.

An address delivered before the Georgia State Horticultural Society at Athens, Ga., August 3rd, 1903.

Reprinted from the Proceedings of the Twenty-seventh Annual Meeting of the Georgia State Horticultural Society.

Mr. President and Gentlemen:

The entomologist in his work meets with two immense groups of insects, those which are injurious and those which are beneficial. There is no need of discussing the former class; the various insects which destroy our fruit trees, garden and field crops, and infest stored products of various kinds are examples. As a matter of course, this group has received the most attention. It is but natural that the attention of the farmer or fruit grower should be more forcibly attracted to the death of his trees or crops than to the constant yet quiet and unassuming work of insects which successfully hold in check many injurious species. Nevertheless it is as much the duty of the entomologist to assist in the increase and distribution of beneficial insects as it is to devise means for controlling the injurious ones. As a matter of convenience we may place the beneficial insects in two groups, those which are indirectly of benefit to mankind by their parasitic habits upon injurious species, and those which are directly beneficial in that they create useful commercial products. The former group may be illustrated by the various "lady-bird" beetles which destroy myriads of scale insects and plant lice; and by the parasitic Hymenoptera—for the most part very minute insects resembling bees or wasps—which live as parasites upon the adults, larvae or even eggs of destructive pests. Of insects directly beneficial we may cite the silk-worm, the cochineal insect and the honey-bee. It is with the latter that we now have to deal. The relation of bees to fruit growing has not received much attention from the average orchardist. I am convinced, however, that it is a subject of much importance, and a discussion of this relationship will, I trust, be of some little interest. It seems to

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me very essential that we should arrive at a clear understanding of the relationship of these two industries, Horticulture and Apiculture, as they are of mutual benefit to each other.

In this connection I wish to read you a short paragraph from the address of your illustrious President, Dr. P. J. Beckmans, made before this body at the second annual meeting at Macon, Ga., on August 11 and 12, 1877. This paragraph bears directly upon our present subject and reads as follows:

"Insects are absolutely needed to fertilize the flowers of several of our standard products; they carry the pollen from one flower to another in species where the male and female flowers are distinct; in others whose organs of reproduction are so formed that they require artificial aid in being fertilized, insects are almost the only means to prevent the species from becoming extinct. Our watermelon growers would find their occupation gone if honey bees and other insects were out of existence. Clover seed would have to be brought from Europe if we did not have the bumble bee to fertilize the flowers.

"We must not forget that to the agency of insects we owe most of our wonderful variety of fine peaches, apples, pears and other fruits; it is by insects that in most cases the flowers of our fruit trees are fertilized by the pollen which they carry from one flower to another, and thus numberless fruits of superior value have resulted from this cross-fertilization.

"Insects have been the earliest hybridists on record, and have been the primary cause of the origin of more desirable perfected horticultural products that can be attributed to our own efforts."

It is unnecessary for me to call your attention to the growth of the Georgia fruit industry within recent years; its progress is manifest. The bee-keeping industry in Georgia, on the other hand, is but partially developed and is in the future destined to make material progress.

In parts of the United States the bee-keepers and fruit men have not always lived in harmony and brotherly love. This unpleasant state of affairs has often been brought about by the erroneous impression existing among the fruit growers that the bees injured the ripening fruits. On the other hand, bee-keepers have often suffered serious damage by orchardists spraying fruit trees while in full bloom. It is not my intention to advocate the interests of either party to the detriment of the other, but instead to carefully consider available facts bearing upon the question. I believe that an impartial consideration will lead us to the conclusion that not only are these two industries perfectly harmless to each other, but that they are mutually beneficial and that every orchardist will find it profitable to himself become a bee-keeper upon a small scale. In order to more clearly set forth the subject I will state it in the form of propositions.

Proposition 1.—That Insects are Essential for the Pollination of Fruit Bloom, and that the Honey Bee More Thoroughly Accomplishes this End than any other Insect.

Under this heading I wish first of all to call your attention to the subject of self-sterility in fruits. It is a recognized fact that many varieties of fruits, when planted in large, solid blocks, often fail to set fruit unless other varieties are near at hand. In other words, many varieties are not susceptible of fertilization by their own pollen. The Wild Goose plum is a notable illustration of this, the pollen from the Wild Goose blossom being unable to fertilize any Wild Goose blossom, whether upon the same or another tree. According to **Waugh** the pollen from Wild Goose is capable, however, of fertilizing the ovules of almost any other variety of plum. Careful studies of self-sterility have been made by Waite, Kerr, Waugh and Fletcher. The latter mentions (Cornell Univ. Bul. No. 181.) the Keiffer and Bartlett pears, Winesap and Willowtwig apples, Susquehanna peach and Napoleon cherry as being among the varieties partially or totally self-sterile. Waugh ("Plums and Plum Culture," p. 285.) states that all the native varieties of plum, except Robinson, all hybrids (so far as observed) and many of the Japanese varieties, are self-sterile.

Hall, Beach and Booth, in their studies of grapes (N. Y. Exp. Sta. Bul. 223) have found that Black Eagle, Brighton, Eldorado, Merrimac and Salem are practically self-sterile. They have also shown that pollen from self-sterile varieties of grapes is powerless to fertilize the ovules of either self-sterile of self-fertile varieties.

So far as I am aware, but little investigation has been made with regard to self-sterility in peaches.

It is not my intention to enter into a discussion of self-sterility except so far as the remedy may be concerned. The above cited cases are sufficient to emphasize the necessity of cross-pollination, or the transfer of pollen from the blossom of one variety to the blossoms of another variety. The remedy for self-sterility naturally divides itself into two steps. The first of these is the planting of such varieties adjacent as will properly fertilize each other. Waugh, in his book on plum culture, recommends pollenizers for 184 varieties of plums. Having planted the proper varieties and having them of blossoming age, attention should be given to the pollination. For the most part, fruit growers have in the past depended upon this being accomplished without their attention. Hand pollination in orchards is of course entirely impracticable. The wind may to some extent distribute pollen but the most important agency is that of insects. Various wasps, beetles, butterflies and bees visit the blossoms in quest of nectar and carry the grains of pollen from one to another. However, no insect so effectually accomplishes this distribution of the pollen as the honey bee, and by various students this insect is regarded as of more importance in this respect than all others combined. For this reason, the more honey bees there are in the vicinity of the orchard the more thorough will be the pollination. Many fruit growers state positively that the fruit yield has been materially increased after the introduction of several colonies of bees into their orchards.

Proposition 2.—That Bees Take Part in Disseminating Pear Blight and Brown Rot, but that these Diseases Would be Practically as Prevalent even were there no Honey Bees.

The disease known as blight or fire-blight, is familiar to all. There are few orchardists who have not witnessed with dismay the sudden death of twigs and limbs on their favorite apple and pear trees. The disease causes the infected twigs to turn a deep brown or black, as if they had been scorched by fire. Its progress is rapid and at times seems to sweep through the orchard or nursery like a veritable conflagration. Fire-blight is caused by a very small germ or microbe, so small as to be invisible except with the aid of a high-power microscope. This germ (*Bacillus Amylovorus*), lives and multiplies in the tender, growing tissues of the wood and is found in abundance in the dying twigs. Waite (Yearbook, Dept. of Agr. for 1895, p. 296) has found that this bacillus, while not particularly hardy or resistant, survives the winter in the tissues of the infected twigs and branches at the point of contact of the healthy and dead wood. When the sap rises in the spring gum exudes upon the infected twigs and these masses of gum are found to be teeming with the blight bacillus. Various insects visit these twigs and sucking up the gummy secretions, take with it thousands of the germs. The insects also visit the opening blossoms in search of nectar and leave therein the germs from the infected twigs. The bacillus can live and multiply in the nectar of the blossoms and hence is carried by the visiting insects from one blossom to another. While bees do assist in spreading the blight, we cannot lay the blame for the malady at their doors, for were they entirely removed a horde of other insects would still continue the dissemination. Among these we may mention various [illegible] (Hemiptera), wasps, bumble-bees, butterflies, hornets, flies and beetles. Theoretically the removal of all insects from the orchard would prevent the spread of blight, and doubtless such would be the case. Such removal, however, is utterly impossible and were it accomplished even cross-polli-

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nation would be at an end, and the result would be an almost certain failure of the crop in the case of varieties which are partially or totally self-sterile.

Waite (l.c.) has shown that the only logical and practical remedy for blight is to cut out during winter all infected twigs and branches, keeping the pruning knife thoroughly disinfected while doing the work. We must look to this means for controlling and preventing blight, and not to methods put in use after the disease is rampant in the orchard.

We come now to a brief consideration of brown rot, which disease is likewise only too familiar to growers of peaches and plums. The rotting of the fruit upon the tree, in transit and upon the market is the cause of an enormous annual loss. The brown mushy appearance of fruit destroyed by brown rot needs no description. The disease, like blight, is caused by a low form of vegetable life which differs in many respects from the blight germ, and is commonly designated as a "fungous disease." Whereas in the case of blight the introduction of a single germ serves to produce the disease, in the case of brown rot the dissemination or spread is by spores or fruiting bodies. These spores correspond in a general way to the seeds of higher plants. Unless these spores are present the familiar brown rotting of fruit cannot take place.

The fact that this disease is most prevalent in damp, rainy seasons has often given the impression that it is caused by damp weather. The presence of moisture is essential and favorable to the development of the fungus, and hence damp seasons must be regarded as offering conditions favorable for brown rot, and not as its cause.

For our present purpose we may consider two phases of brown rot, that attacking the blossoms and that attacking the growing fruit, bearing in mind, however, that in both cases the disease is identically the same. Honey bees, as well as other insects, visit the diseased and healthy blossoms indiscriminately and doubtless in this way spread the malady, although so far as we are aware, this has not been definately proven. Here again, were the bees entirely removed the dissemination would still take place through the agency of other insects.

Where the growing peaches rot while still upon the trees the observer will find many bees busily at work upon the decaying portions, as well as upon over-ripe fruit which has been broken open by too rapid growth or by accident. In this way it is possible for the bees to carry the brown rot spores from decaying fruit to the flesh of other fruit which is injured or broken open.

We wish right here to emphasize the fact that the mouthparts of the honey bee are so constructed that the bee never punctures, bites or lacerates the skin of sound fruit.

This was demonstrated in experiments conducted by Prof. Riley as early as 1885, (U. S. Ent. Rep. 1885), and again in 1901 by Mr. John Fixter of the Canada Department of Agriculture. (See Report of Entomologist and Botanist in Annual Report on Experimental Farms for 1901, p. 254.) Mr. Fixter exposed to the attack of bees, sound fruit, sound fruit dipped in honey, and fruit which had the skin cut and punctured. The bees readily took the juice from the punctured fruit and cleaned off the honey from the dipped fruit. Although the bees were in a starving condition they failed to puncture any of the sound fruit. Hence we see that only after decay has softened the fruit skin or the latter has been injured from other causes can the little honey bee obtain access to the fruit. The introduction of brown rot into healthy and sound fruit, by the honey bee, is therefore impossible. He who doubts this statement will find the confirmation in his own orchard, where, if he will observe closely, he will find that the bees do not visit the sound fruit. The same does not hold true of other insects which have powerful biting or piercing mouthparts. It has been shown by Scott and Fiske (Bul. No. 31, Div. Ent. n. ser. pp. 24 to 36), that the Curculio opens the way for the entrance of the brown rot fungus and also that the leaf-footed plant bugs (Coreidae) piercing healthy and diseased fruit alike, are material agents in spreading this disease.

We must therefore conclude, both from observation and from the experience of many fruit growers, that the more abundant the honey bees the more thorough will be the cross-pollination in our orchards, and as a result the better will be our crop. We also see that although the bees do take part in the dissemination of fire-blight and possibly to a limited extent, brown rot, yet the removal of the bees would not perceptibly decrease the prevalence of these diseases. The balance of the account, when all things are considered is decidedly in favor of our friend the bee. We therefore strongly urge the keeping of bees in or near every orchard—not in the old style “box-hive” or “gum”—but in frame hives of modern make and pattern, which will yield a definite and not inconsiderable profit in the honey produced.

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